

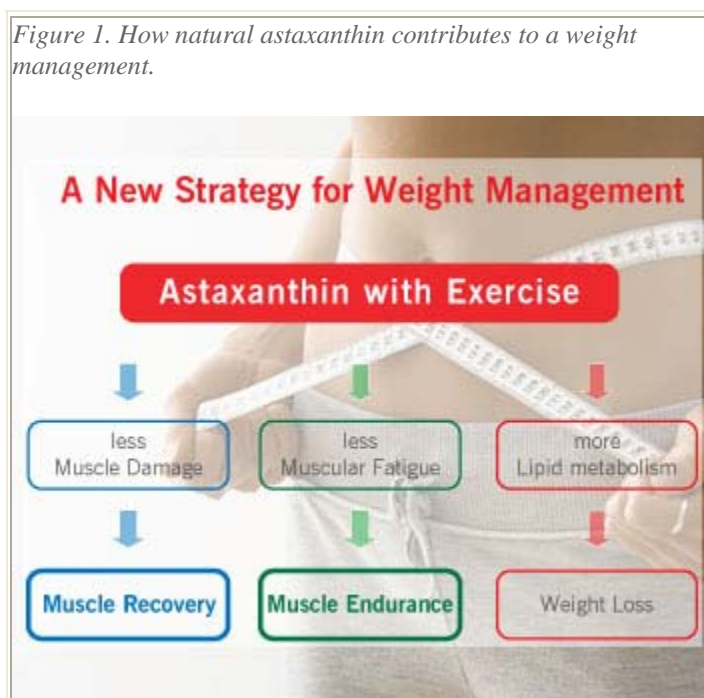
How AstaREAL® Astaxanthin Works in Weight Management

~Part 2~

Introduction

Last month, Part 1 explained how the synergy of natural astaxanthin and exercise may improve a weight management program by boosting fat metabolism (Figure 1). In this concluding issue, we reveal how natural astaxanthin may improve muscle endurance and reduce muscle damage. Exercise is an essential part of weight management, however, it is usually a challenge to follow the program. For example, not only do people tend to encounter physical barriers such as muscle soreness and endurance, but those barriers could also be mental stumbling blocks. Combined this with peoples' high expectations, weight-loss attempts can quickly lead to failure. In this situation, natural astaxanthin may help by reducing muscle soreness and improving endurance.

Figure 1. How natural astaxanthin contributes to a weight management.



Lower Muscle Soreness and Faster Muscle Recovery

It is well known that oxidative stress caused by reactive oxygen species (ROS) increases during strenuous physical activity and prolonged exposure will damage muscle. Natural astaxanthin has been shown to protect muscle cell membranes from oxidative damage during strenuous physical activity¹.

Figure 2 reveals ROS damaged muscle as dark areas after strenuous exercise whereas astaxanthin intake reduced oxidative damage of heart and leg muscle cells. Furthermore, other data showed significant reduction of DNA damage and lowered inflammatory markers^{1,2}. In reality, we should experience less muscle soreness and possibly shorter recovery times between exercise sessions. It is worth noting that the reduction of muscle damage by astaxanthin will not affect muscular strength

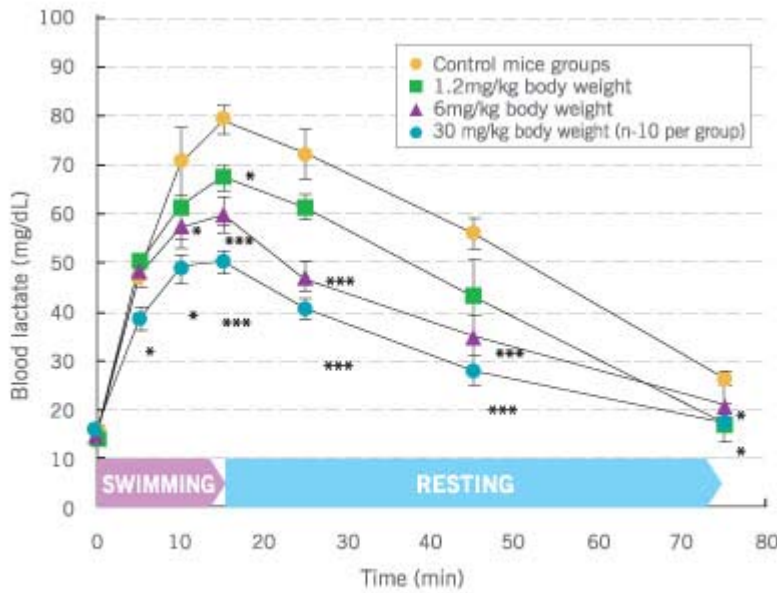
development because it is the Super Recovery process rather than muscle damage that builds muscle strength. Moreover, repeated muscle damage increases collagen and muscle is filled with protein that doesn't contribute to strength.



Increased Muscle Endurance

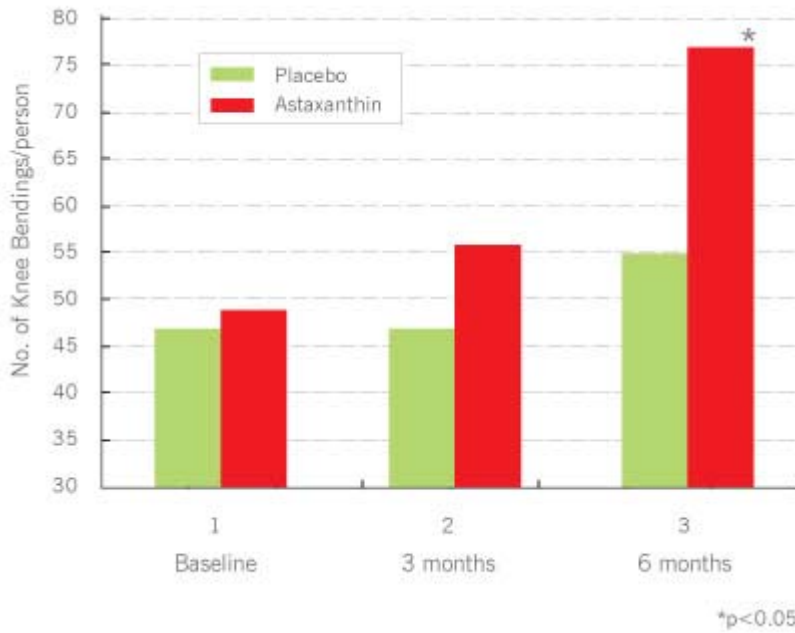
Natural astaxanthin increases muscle endurance but the mechanism is not yet fully understood. Based on several findings in animal and human studies, we can begin to build a better picture. Miyawaki *et al.*, demonstrated that astaxanthin intake significantly improved blood flow which means more oxygen and fuel reaches the muscles and better removal of waste material³. Combine this effect with enhanced lipid metabolism, this synergy could explain why there is significantly lower lactic acid build-up^{4,5} (Figure 3) after swimming or running experiments and increased endurance levels⁶ (Figure 4).

Figure 3. Natural astaxanthin reduces blood lactate build-up during swimming (Ikeuchi et al., 2006).



Astaxanthin reduced build-up of lactic acid in a dose-dependant manner. mean ± S.E. *p<0.05, ***p0.005 vs, control

Figure 4. Natural astaxanthin increased the average number of knee-bends performed on a Smith machine (Malmsten et al., to be published).



Conclusion

Natural astaxanthin may enhance muscle recovery and muscle endurance by protecting our bodies against oxidative damage and improving blood flow during exercise. In turn this should ultimately improve the chances of fulfilling the exercise requirements.

The two part newsletter on how astaxanthin works in weight management revealed three important physical benefits viz. weight loss, muscle recovery and muscle endurance. Validated by clinical trials and other supporting studies, natural astaxanthin increased lipid metabolism, reduced muscle damage and increased endurance. Combine these effects with a sensible food intake and regular exercise, natural astaxanthin can help achieve goals set out in a weight management program.

References

1. Aoi *et al.*, (2003). Astaxanthin limits exercise-induced skeletal and cardiac muscle damage in mice. *Antioxid Redox Signal* 5(1):139-144. 2. Lee *et al.* (2003). Astaxanthin inhibits nitric oxide production and inflammatory gene expression by suppressing IκB Kinase-dependent NF-κB Activation. *Mol. Cells*, 16(1):97-105. 3. Miyawaki *et al.*, (2005). Effects of astaxanthin on human blood rheology. *J. Clin. Ther. Med.* 21(4):421-429. 4. Ikeuchi *et al.*, (2006). Effects of astaxanthin supplementation on exercise-induced fatigue in mice. *Bio. Pharm. Bull.* 29(10):2106-2110. 5. Sawaki *et al.*, (2002). Sports performance benefits from taking natural astaxanthin characterized by visual activity and muscle fatigue improvements in humans. *J. Clin. Ther. Med.* 18(9):73-88. 6. Malmsten (To be published). Dietary supplementation with astaxanthin rich algal meal improves muscle endurance – a double blind study on male students. Karolinska Institute, Stockholm .

Patent Information

Medicament for improvement of duration of muscle function or treatment of muscle disorders or diseases.

Method of inhibiting the expression of inflammatory cytokines and chemokines.

Composition for body fat reduction.

Composition for medical treatment and improvement of metabolic syndrome.

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